

# INSTALLATION AND MAINTENANCE

## Metallic Expansion Joints

Expansion joints are designed to absorb movement according to predetermined design data. In order to achieve the maximum service life, pressure resistance and reliability, caution should be taken during handling, storage and installation of the expansion joint. Expansion Joints are special items that can be damaged easily. Failure to comply with the installation instructions could reduce the service life and pressure capacity of the expansion joint, which could lead to damage or at worst breakdown of the expansion joint or the pipe system.

## Storage and Transport

We recommend that a visual inspection is carried out immediately on receipt of the expansion joint to ensure that it has not been damaged during shipment.

- » Transport fittings, tie rods, hinges or gimbals should not be used to sling and lift the expansion joint. Expansion joint should not be lifted by slings or chains around the bellows and must not be lifted in a manner which causes the bellows to be subjected to mechanical loads.
- » Expansion joint must not be subjected to torsion during handling and installation.
- » Expansion joint should be stored on an even, solid surface in a clean and dry environment under a roof or waterproof cover.
- » Expansion joints should not be stacked on top of each other or knocked against each other.
- » If the weight of the end fittings tends to cause the bellows to bend, the ends should be braced using wooden supports.
- » Care should be taken to avoid mechanical damage as well as damage by water, moisture, sand, soil, building materials and chemicals.

### Transport fittings/pre-tensioning fittings

Transport and pre-tensioning bars will be identified by yellow and tape. These fittings must NOT be removed until the expansion joint is fully installed. If these devices are removed prematurely expansion joint may move to an incorrect condition and could possibly endanger people working in the vicinity. Furthermore, premature removal could cause the expansion joint not to function as intended, which could result in reduced service life or at worst breakdown of the expansion joint.

## INSTALLATION

Installation should be carried out by properly trained and competent staff working in compliance with relevant legislation and regulations for occupational safety.

### Prior to installation

- Unless clearly stated in the design data of the expansion joint, expansion joint is not designed to compensate for installation inaccuracies in the piping and must not be used to correct them. Prior to installation, expansion joint should also be checked that, it is not damaged and has no dents, damaged fittings and water marks on the steel (incipient rust), etc. It should also be checked that:
- » Expansion joint is free from foreign objects such as insulation materials, dirt or debris.
  - » Sealing surfaces on flanges are even and clean.
  - » Gap in the pipeline where the expansion joint is to be installed matches the specified installation length of the expansion joint with design tolerances taken into account. Expansion joint must be fitted at the length stated in the specifications.
  - » Connecting ends of the pipeline are clean and correctly prepared for welding.
  - » Installation location of the expansion joint in the pipeline complies with that determined by the system designer.
  - » Expansion of the pipeline is in accordance with the design data of the expansion joint.
  - » Adjacent pipework is correctly installed with anchors, guides and supports in place.
  - » Anchors must be adequate to accept reaction forces from the expansion joint and all other pipework loads.
  - » Only one expansion joint is fitted between two main anchors.
  - » Tie rods on lateral expansion joints are correctly fitted and are secure.

### Anchors/Guides

Anchors and guides on the pipeline must be placed as per the guidelines in EJMA so that:

- » Expansion joint is not subjected to dead-weight loads from the pipeline.
- » Pipeline does not sag, “hog” or “snake” between anchors or guides.
- » Drop rods or hanger rods should be avoided, guides should be slide or roller type.
- » When using expansion joints, distance from first guide to expansion joint must not exceed 4 x nominal diameter of the pipeline.
- » Distance between the first and the second guide must not exceed 14 x nominal diameter of the pipeline.

### During Installation

- » When welding or grinding near the expansion joint, expansion joint should be protected against weld spatter and debris. We recommend using a chloride free welding blanket.
- » Care must be taken to avoid accidental arcing on the thin-walled bellows in the expansion joint.
- » Expansion joint should be protected from damage caused by adjacent construction work, splashes from mortar or plaster can damage the expansion joint and must be avoided.
- » If the expansion joint is equipped with an inner sleeve, make sure the flow arrow on the expansion joint points in the direction of the system flow.
- » When installing angular expansion joints it is important that the hinge pins are in the correct orientation.
- » Do not apply torsion to the expansion joint to align the bolts on flanged units.
- » Components such as tie rods, hinge links and gimbals must not be removed. They form part of the integrity and functionality of the expansion joint.
- » Care should be taken with installation tools. Attention should be given not to damage the bellows with spanners or wrenches when tightening bolts.
- » On flanged units ensure that over-long studs or bolts do not contact and damage the bellows.
- » When expansion joints are supplied without external covers and insulation is to be added a lagging cover should be fitted to prevent insulation material becoming trapped between the bellows convolutions where it can prevent the bellows from functioning correctly.

### On completion of installation

Before the completed system is tested and commissioned it should be subjected to a visual inspection. Many years experience has shown that careful checking of the installation before pressure testing and final commissioning will help to ensure successful installation and performance. Before pressure testing and as part of the inspection regime ensure that all temporary shipping and pretensioning devices (marked by yellow and black striped tape) are removed from the expansion joint.

## PRESSURE TEST

Pressure test must be carried out according to the stated test specifications on the drawing and/or the tag plates on the expansion joint.

### Prior to pressure testing CHECK THE FOLLOWING

- » Has the expansion joint been damaged during installation?
- » Is the entire pipe system, especially anchors, guides and expansion joints, installed as shown in the drawings in the installation instructions?
- » Is the expansion joint correctly fitted into the system and not used to correct fabrication inaccuracies?
- » Is the flow direction of the expansion joint correct?
- » Are the bellows and other moving parts on the expansion joint free from foreign objects such as insulating material?
- » Have all shipping bars, pre-tensioning devices, protective parts and packaging materials been removed?
- » Have all guides, supports and expansion joints been released to allow the expected movements in the pipe system?
- » If the system is designed for a light flow medium such as air or gas and is to be tested with a heavier medium such as water have the necessary steps been taken to ensure that the extra dead-weight loads to the expansion joint and pipe system can be safely accommodated?

## During pressure testing CHECK THE FOLLOWING

- » Pressure should be increased gradually until the specified test pressure is reached.
- » Check the expansion joint for any sign of leakage at the connections and check the gauges for pressure drops.
- » Examine the expansion joint for any signs of twisting, instability, squirming at the bellows or unexpected movement of any of its components.
- » Any unexpected movement of the pipe system which could be pressure-related should be investigated and addressed.

## After pressure testing CHECK THE FOLLOWING

The expansion joint and pipe system should remain as designed, in particular check that the anchors and their attachments to civil works or structure do not display any signs of distress. It should be noted that after testing some residual testing fluid may remain in the bellows, if this is likely to affect the functioning of the system arrangements to remove the fluid may be necessary.

## AVOID

- » Dropping or knocking the bellows.
- » Using cleaning agents containing chlorides.
- » Using steel wool or steel brushes on the bellows.
- » In case of any doubt, test, pressure should not exceed more than 1.5 x design pressure without previous written confirmation from manufacturer.

## MAINTENANCE

A correctly dimensioned and correctly installed expansion joint does not require any special maintenance other than the inspection that is carried out for the other parts of the pipe system in which the expansion joint is installed. We recommend that you carry out ongoing inspection of the pipe system throughout its service life. The aim of these inspections is to check for the presence of rust, whether parts have come loose, etc. Frequency of these inspections is determined on an individual basis based on the function of the system, occurring loads and so on.

The above does not guarantee that damage will not occur, but it does significantly reduce the risk. It may be useful to know the common causes for faults in expansion joints. However, it is difficult to list all general maintenance directions as expansion joints have a wide field of application and many expansion joints are constructed for a specific application. We would like to draw your attention to the most common causes for failures below:

### Shipping and handling damage

- » Knock-damage, dents, scuffs and scratching of the bellows caused by incorrect handling or inflicted after installation.
- » Unanticipated detrimental influences from the environment such as corrosion caused by salt, chemicals or the like in the atmosphere.

### Installation damage and installation errors

- » Incorrect location - installing expansion joints at a position in the pipework not intended by the system designer.
- » Using the expansion joint to correct fabrication errors without first confirming this is acceptable with the designer
- » Premature removal of shipping or pretensioning devices or failure to remove them after installation.
- » Damage from weld spatter due to lack of protection during installation.
- » Installation of units fitted with flow liners with the liner against the flow direction.


### Operational Damage

- » Corrosion damage caused by medium, in particular chloride presence.
- » Fatigue failure due to unforeseen vibration in the system.
- » Fatigue failure caused by movements for which the expansion joint was not designed, especially lateral movements.
- » Damage caused by accumulation and packing of foreign material between the bellows convolutions, this can affect the bellows internally or externally.

## CHECKLIST AFTER INSTALLATION OF EXPANSION JOINT

- Anchors, guides and supports installed in accordance with the system drawings?
- Is the expansion joint installed in correct location?
- Enough space between external cover (if any) and bellows OD?
- All shipping bars, pre-tensioning devices, protective parts and packaging materials been removed? (Components such as tie rods, hinge links and gimbals must not be removed. They form part of the integrity and functionality of the expansion joint.)
- All guides, pipe supports and expansion joint free to permit pipe movement?
- Water removed from bellows convolutions (if system been tested with water)?
- Expansion joint been damaged during handling and installation (visual control)?
- Is expansion joint misaligned?
- Is there enough free space for bellows and other movable parts to do design movements?
- Pre-set conditions (if any) considered during installation?
- Limit rod, nuts are set as per actual movements of the system?
- Any unanticipated movement on the piping due to pressure?
- The expansion joint is free from foreign objects such as dirt or debris?
- Anchors must be adequate to accept reaction forces from the expansion joint and all other pipework loads?
- Tie rods on lateral expansion joints are correctly fitted and are secure.
- When fitting angular expansion joint the hinge pins are in the correct orientation?
- Expansion joint with liner connection positioned through flow direction?
- Any damage on bellows such as dents, gouges, weld splatter ?

## FINAL DOCUMENTS

 <b>KLINGER</b> Turkey www.klingerturkey.com	Type	DN	P	barg
	Mov.	mm	Serial	

Each expansion joints has an identifying tag with a unique serial



Flow arrow stickers are attached visibly if there are liners



Parts that must be removed after assembly are clearly marked

# INSTALLATION AND MAINTENANCE

## Rubber Expansion Joints

### » SERVICE CONDITIONS

Make sure the expansion joint rating for temperature, pressure, and movements match the system requirements. Contact the manufacturer for advice if the system requirements exceed those of the expansion joint selected. Check to make sure the elastomer selected is chemically compatible with the process fluid or gas.

### » ALIGNMENT

Expansion joints are normally not designed to compensate for piping misalignment errors. Misalignment reduces the rated movements of the expansion joint can induce severe stress and reduce service life. Pipe guides should be installed to keep the pipe aligned and to prevent undue displacement.

### » MATING FLANGES

Install the expansion joint against the mating and pipe flanges and install bolts so that the bolt heads and washers are against the retaining rings. If washers are not used, flange leakage can results-particularly at the split in the retaining rings. Flange-to-flange dimensions of the expansion joint must breach type opening. Make sure the mating flanges are clean and are flat-face type or no more than 2mm raised-face type. Never install expansion joints that utilize split retaining rings next to water type check or butterfly valves. Serious damage can results in rubber joints of this type unless installed against full-face flanges.

### » TIGHTENING

Tighten bolts in stages by alternating around the flange. If joints have integral rubber flanges, bolts should be tight enough to make the rubber flange OD bulge between the retaining rings and main flange. Torque bolts sufficiently to assure leak-free operation at hydrostatic test pressure. Bolt torquing values are available from most manufacturers. If the joint has metal flanges, tighten bolts only enough to achieve a seal and never tighten to the point that there is metal-to-metal contact between the joint flange and the mating flange.

### » STORAGE

Ideal storage location is a relatively dry, cool warehouse. Recommended room temperature is +10/+20 °C. Temperature below 0°C is only acceptable provided that the expansion joints are handled after a gradual return to positive temperatures. Provide minimum natural ventilation. Ozone and ozone-generating sources must be kept away from the storage area. Expansion joints must not come into contact with the following aggressive products or items: Liquids, grease, acids or bases sharp items or burning, welding or grinding particles. Avoid stacking the expansion joints in so far as possible to prevent any permanent significant deformation (arch, bead) rotate stocks to ensure that the oldest products are used first. (FIFO)

### » ANCHORING

Solid anchoring is required wherever the pipeline changes direction, and expansion joints should be located as close as possible to anchor points if anchors are not used the pressure thrust may cause excessive movement and damage the expansion joints. Piping must be supported so expansion joints do not carry any pipe weight.

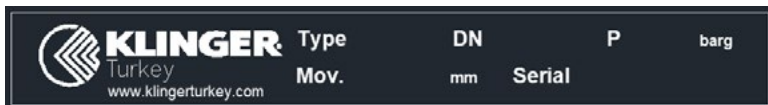
## ADDITIONAL TIPS

- » Do not insulate over a non-metallic expansion joint; However, if insulation is required, it should be made removable to permit easy access to the flanges. This facilitates periodic inspection of the tightness of the joint bolting.
- » It is acceptable (but not necessary) to lubricate the expansion joint flanges with a thin film of graphite dispersed in glycerin or water to ease disassembly at a later time.
- » Do not weld in the near vicinity of a non-metallic joint.
- » If expansion joints are to be installed underground, or will be submerged in water, contact the manufacturer for specific recommendations.
- » If expansion joint will be installed outdoors, make sure the cover material will withstand ozone, sunlight etc. Materials such as Neoprene and Chlorobutyl are recommended. Materials painted with weather-resistant paint will give additional ozone and sunlight protection.
- » Check the tightness of leak-free flanges two or three weeks after installation and re-tighten if necessary.

# CHECKLIST AFTER INSTALLATION OF EXPANSION JOINT

- Anchors, guides and supports installed in accordance with the system drawings?
- Is the expansion joint installed in correct location?
- Enough space between external cover (if any) and bellows OD?
- All shipping bars, pre-tensioning devices, protective parts and packaging materials been removed? (Components such as tie rods, hinge links and gimbals must not be removed. They form part of the integrity and functionality of the expansion joint.)
- All guides, pipe supports and expansion joint free to permit pipe movement?
- Water removed from bellows convolutions (if system been tested with water)?
- Expansion joint been damaged during handling and installation (visual control)?
- Is expansion joint misaligned?
- Is there enough free space for bellows and other movable parts to do design movements?
- Pre-set conditions (if any) considered during installation?
- Limit rod, nuts are set as per actual movements of the system?
- Any unanticipated movement on the piping due to pressure?
- The expansion joint is free from foreign objects such as dirt or debris?
- Anchors must be adequate to accept reaction forces from the expansion joint and all other pipework loads?
- Tie rods on lateral expansion joints are correctly fitted and are secure.
- When fitting angular expansion joint the hinge pins are in the correct orientation?
- Expansion joint with liner connection positioned through flow direction?
- Any damage on bellows such as dents, gouges, weld splatter ?

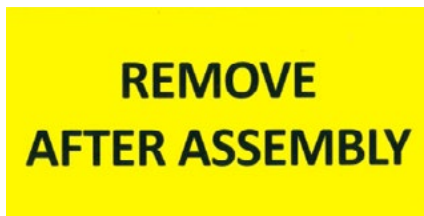
## FINAL DOCUMENTS



Each expansion joints has an identifying tag with a unique serial number



Flow arrow stickers are attached visibly if there are liners



Parts that must be removed after assembly are clearly marked